horizontally on each side of the opening of the cage, approximately ½-inch from the top. The bin is placed in the cage opening by inserting the lip and allowing the inverted V cut to rest on the bottom of the opening. It can then be swung either in or out until it is stopped by the extension lip on either side of the bin. To secure the bin in the "in" position, the bolts are slid over the outside of the bin; in the "out" position, they are slid into holes (13) drilled into the ends of the bin. When the bin is removed for cleaning, a metal plate slightly larger than the opening and having small tabs bent in on the bottom edge can be inserted to prevent escape of the animals.

Acid Phosphatase and Lipids in the Mast Cells of the Rat[1]

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The presence of alkaline phosphatase and cytochrome oxidase, localized in the form of cytoplasmic granules in the mast cells, has already been reported (*4, 5*). Acid phosphatase has been stated to occur only in negligible amounts in the mast cells (*4*). With a slight modification of the technique of Gomori and of Wolf, Kabat, and Newman (*2*), we have been able to demonstrate that acid phosphatase, like alkaline phosphatase, is abundant in the mast cells. This enzyme is localized in the mast cells as discrete, coarse, cytoplasmic granules, brown to black in color. This localization in granules, in contrast to the diffuse appearance of the enzyme in other tissues (*3*), suggests that possibly these granules which contain acid phosphatase correspond to the mast granules. No phosphatase activity was found in the nucleus.

To demonstrate acid phosphatase activity in tissues embedded in paraffin it is necessary to incubate them in the buffered substrate for comparatively long periods of time. For this reason it is thought that the method is faulty, and that perhaps the enzyme is partially denatured during infiltration in paraffin at high temperatures. For the demonstration of acid phosphatase, tissues are fixed in chilled acetone for 12 hours or longer, cleared in toluol or chloroform, infiltrated in paraffin, sectioned, and mounted in the usual manner. The deparaffinized sections are then incubated at 37° C. in a solution of sodium β-glycerophosphate buffered (acetate) to pH 4.7. In these sections enzyme activity in the mast cells is shown after long periods of incubation and is never clear before 24 hours. Often the section must be incubated 72 hours or longer. Better results are obtained when the paraffin infiltration method is eliminated. Whole mesenteries are spread on pieces of cork (previously immersed in cold acetone) and fixed in chilled acetone overnight. The acetone is removed in several quick rinses of distilled water, and the mesenteries incubated in the buffered substrate at 37° C. Some acid phosphatase activity is noted within 1 hour in granular foci in the mast cells. Maximal enzyme activity is obtained in 4–6 hours. Longer incubation periods are undesirable, because after 24 hours the mast cells become so dark that details are obscured. It seems advisable, then, to eliminate the paraffin method from this technique whenever possible. Perhaps embedding in collodion would be satisfactory, since it does not require infiltration at high temperatures.

Our previous findings do not reveal lipids stainable with Sudan IV in the mast cells of the rat. Although Sudan IV gives consistently negative results in the mast cells, when Sudan black B is applied to frozen sections of tissues fixed in formal calcium-cadmium (*1*), black granules are revealed in the cytoplasm of the mast cells. These lipid granules resist dissolving with solvents and appear to represent phospholipids. Lipid granules have been demonstrated previously in human mast cells (*5*) by the use of Sudan black.

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Sulfur Collection in Precipitation by Means of an All-Weather Noncorrosive Rain and Snow Gauge[1]

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Sulfur, an essential element for the growth of plants and animals, is known to be present in three amino acids (cystine, methionine, and djenkolic acid), the tripeptide glutathione, and two vitamins (thiamine and biotin). Increasing attention is being given to the content in foods of the sulfur-containing amino acids (*2*) as factors in food quality. The total sulfur in plants (and possibly the total of these essential sulfur compounds) is increased by increasing the supply of available sulfur in soils (*4*).

In the course of ordinary fertilizer practice, available sulfur has been supplied to the soil in the form of ammonium sulfate, potassium sulfate, and superphosphate. However, with the anticipated increased use of higher-analysis fertilizers these sources of sulfur will be decreased. Thereafter, except for a small reserve in the soil, the chief natural source to growing plants will be that brought down in the precipitation.

With regard to soil reserves, Lipman and Conybeare (*3*) have reported that, on the average, the soils in the United States contain only about 700 pounds of total sulfur/acre. This is for the most part insoluble and unavailable at any one time; also, that becoming available is subject to rapid loss by leaching. Thus, the quantity of sulfur brought down by precipitation will become increasingly important.

In order to measure the sulfur brought to the soil in rain and snow, a special rain gauge has been designed at this Station. The two general requirements to be met in making this gauge accurate and workable for the purpose were: (1) prevention of absorption of sulfur in gaseous form from the air, and (2) effective functioning in both winter and summer.

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Alway (*1*) has shown that certain metals, when used as the collecting vessel, might absorb considerable sulfide from gaseous form in the atmosphere. Of the common construction metals, aluminum is the only one which does not form an insoluble sulfide in air, and this metal was therefore selected as the basic material for the gauge.

The second requirement entailed the collection of a representative catch of rain and snow in winter, at the same time avoiding damage to the apparatus due to freezing. This problem was met by constructing a well-insulated gauge, with storage container below frost line. A cross-sectional sketch is shown in Fig. 1. Once the gauge is installed, the water is

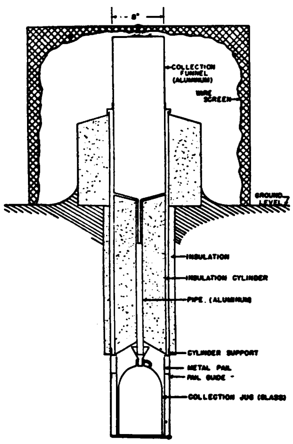

FIG. 1

collected in an ordinary 1-gallon jug placed inside an insulated waterproof cylinder (well), which is sunk below the frost line. The dismantled unit is shown in Fig. 2.

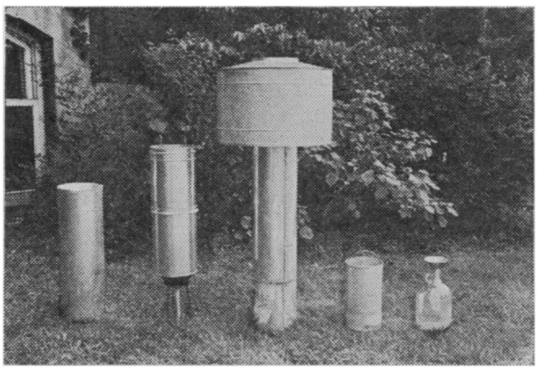

FIG. 2

Insulation (Fig. 1) to make the well arrangement an effective protection against freezing involved: (a) an insulation cylinder of glass wool, 28 inches long, separating the collection funnel from the gallon jug. A 1-inch aluminum pipe extends through the insulation cylinder from the collecting funnel to the small funnel in the jug; (b) a cylinder of 5 inches of glass wool around the exterior of the above-ground portion of the well; (c) a cylinder of 1 inch of glass wool around the below-ground portion of the well; and (d) a coat of lamp black on the exterior of the above-ground parts to absorb all possible heat from the sun in the winter. At the 3-foot level in the ground (depth of the middle of the jug), although the temperature varied between 26° and 41°F. at Lafayette, Indiana, during the period February 11–20, 1947, neither the gauge nor the contents were damaged. This suggests the advisability of thicker insulation and deeper placement in colder regions.

The gauge is relatively easy to manipulate, since only three units need to be handled in order to reach the collected water (solution). After the collecting funnel is removed, the insulation cylinder is drawn out, and finally, an iron rod is used to hook the pail containing the collection jug. The pail is used as a precautionary measure, a safety factor if the jug breaks. The gallon jug is large enough to hold 5.4 inches of rain, which is more than the average monthly rainfall in this area. In the event of heavy rains it is changed as often as may be required.

Farmer cooperators who operate the gauge regularly send the jug containing the solution to the Station for analysis. When snow collects in the funnel and is not melted by the heat of the sun or increase in air temperature, the farmer operator removes the funnel and the collecting bottle to the house, covers the funnel, sets it on a suitable stand, and the snow is melted into the jug. The collecting funnel stem fits into the smaller funnel, thus preventing any loss during melting.

In choosing the site for the gauge, it was considered important to take cognizance of the variable sulfur content of the air as affected by external conditions. Volk, Tidmore, and Meadows (*4*) reported a variation of from 7.23 pounds SO_3/acre annually at Kinston, Alabama, a rural area, to 76.79 pounds SO_3/acre near Birmingham, Alabama, an industrial area. Thus, sulfur deficiency would be expected in the former area but not in the latter. Four major factors were considered in choosing a site: (1) proximity to an industrial area; (2) proximity to a railroad; (3) direction of prevailing winds in relation to the sources of smoke; and (4) careful selection of site in order to catch a good sample of the rainfall representative of the conditions selected, considering the three foregoing factors. Ideally, the gauge should be placed in a clearing within a forested area (especially for snow collection). Since this requirement could seldom be met, it was concluded that meeting the following requirements would insure relatively representative sampling. The first three items are those set forth by O. E. Hays, of the Soil Conservation Service, in a communication to one of us (M. L. J.) in October 1944.

(1) The site should be nearly level and protected from grazing stock.

(2) Any area which suggests localized differential wind conditions should be avoided.

(3) Exposure from the sky must not be obscured; as a working rule the gauge is set at least twice as far from any obstructing object as the obstructing object is high.

(4) As suggested in 1945 by N. J. Volk, a wire screen, placed around, and slightly higher than the gauge (Fig. 1), will prevent contamination by bird perching, since birds tend to light on the screen in preference to the gauge. The screen will also serve as a windbreak.

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